Geel 2000 Language Schools

Science Department



Prep. (3)

First term



(2024 -2025)

Name:………………………………….

Class: ………………………………….

Unit one

Lesson one — Motion in one direction

Motion:

is the change of the object's position as time passes according to position of another object.

Notes:

1. Movement of metro or train considered as examples of motion **in one direction.**

Bec. They can move forward or backward, not upward or downward.

2. Their path may be **curved, straight both.**

Moving in straight line in one direction is considered the **simplest type of motion**

Speed: is the distance moved through unit time

i. Factors affecting speed are (**distance & time**).

ii. $V = \frac{\Delta d}{\Delta t}$

iii. Measuring units of speed ***(meter/second) (m/s)*** when distance measured by meter and time measured by second,
Or ***(kilometer/hour) (Km/h)*** when distance measured by kilometer and time measured by hour (in case of cars, trains and planes).

To change from km/h to m/s (x 1000/3600) or (5/18)

To change from m/s to km /h (x 3600/1000) or (18/5)



Speedometer

Is a counter used **to identify the speed of car directly.**





Uniform (regular) Speed

Non-uniform (irregular) Speed

1-Uniform speed:

***Object covers equal distance in equal periods* of time.**

***Give reasons:**

It is hard to measure a regular (uniform) speed practically.

Due to condition of the road and traffic.

***What's meant by a car speed is 120 km /h.**

-This means that car covers distance 120 km in one hour.

2-Non-Uniform speed:

Object covers equal distance in unequal periods of time.

Or

Object covers unequal distance in equal periods of time.



So: we need to use (***Average speed).***

Average speed: ***It is the total distance covered divided by the total time taken.***

$$\bar{V} = \frac{\text{total distance covered}}{\text{total time}} \qquad \bar{V} = \frac{d}{t}$$

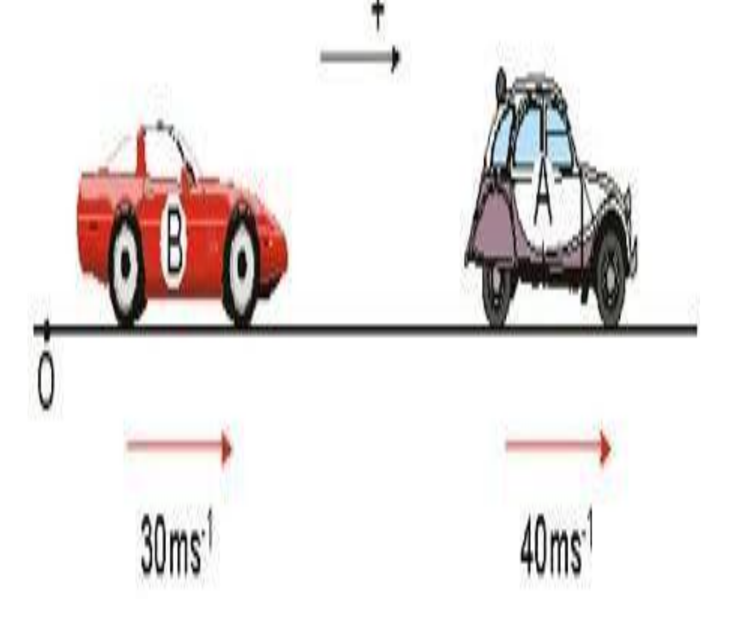
- When an object moves with a uniform speed :

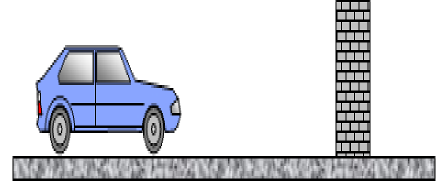
  The average speed = the uniform speed (V = $\bar{V}$).

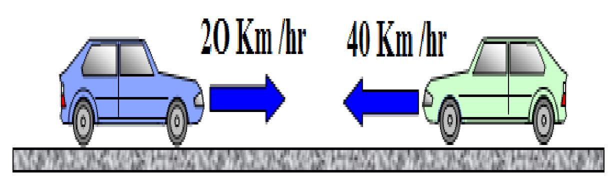
Relative speed: it is the speed of the moving object relative to the observer.

Note:

- Relative speed depends on the position of the observer.
- Relative speed = $V_1 -$ when objects move at the **same direction**.
- Relative speed = $V_1 + V_2$ when objects move in **opposite direction.**









Exercise

1. Write the scientific term:

a. The distance that a moving object covers within a unit time.
(.......................................)

b. A moving object covers equal distance at equal periods of time.
(...)

c. The total distance that moving objects covers divided by the total time taken to cover the distance. (..)

d. The value of the object's speed relative to the observer.
(...)

2. Give reasons for:

1. Cars and planes are provided with speedometers.
   ....
2. We say that the body moves with uniform speed.
   ....

3. Calculate:

1. A train moves from Cairo to Alexandria a distance of 250 km in 2 hours find its speed.
   ....
2. Calculate the average speed of a car moves in a circular bath its length 300m for three rounds in 3 minutes.
   ....



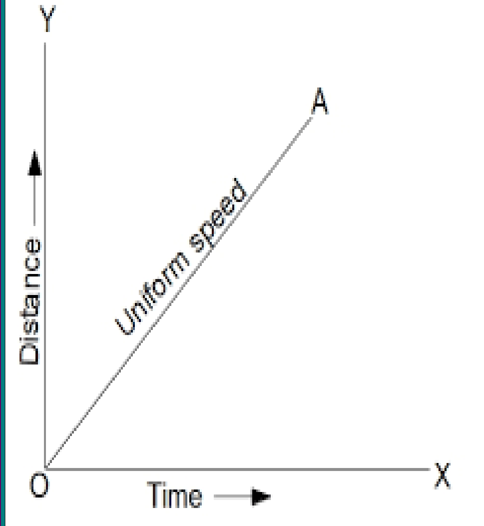
Unit one
Lesson two
Graphical representation of moving in straight line

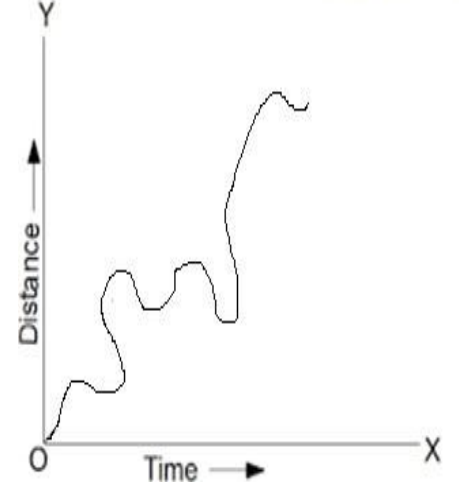


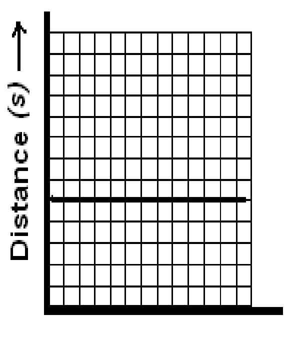
- ***Physicists use another mathematical relations like graphs and tables. To:***
  1. ***Predict the relation between certain physical quantities.***
  2. ***Understand practical*** **results**
  3. ***Describe physical phenomena in an easier way.***

➢ **Graphic representation of regular (uniform motion):**

Number of trial	Covered distance (d) meter	Time needed to cover this distance (t) second	Speed V = $\frac{d}{t}$ (m/s)
1	0.4	5	0.08
2	0.6	7.5	0.08
3	0.8	10	0.08
4	1.0	12.5	0.08







Distance-time graph of an object at rest



Acceleration:

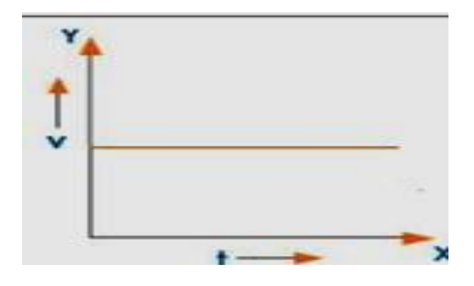
It is the change of an object's speed in one second (per unit time).
It is the rate of change of speed.

$$\text{Acceleration } (a) = \frac{\text{Change in speed } (\Delta V)}{\text{Time } (\Delta t) \text{ in which change occurs}}$$

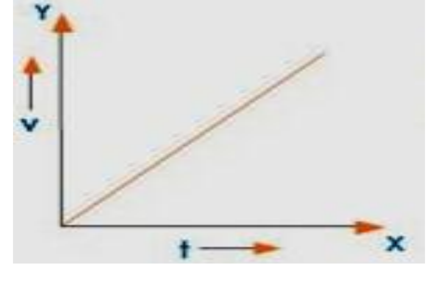
Acceleration units = **meter/second²**

Uniform acceleration it is the change (increase or decrease) of the object's speed by equal values through equal intervals of time.

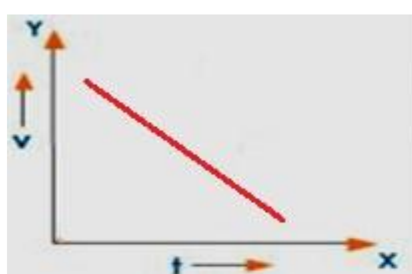
Graphic representation of uniform (regular acceleration):



- The body moves with **uniform speed.**
  V (final) = V (initial)
  Acceleration (a) = zero.



- The object moves with **irregular speed**
  1- V (final) > V (initial)
  It moves with increasing acceleration.
  (Speeding up) (+ve acceleration)



2- V (final) < V (initial)it moves with deceleration.

(Slowing down). (- ve acceleration)



Exercise

A. Write a suitable word to complete the following sentences:

1. Acceleration (a) = $\frac{\text{.................... Speed − .... Speed}}{\text{Time } (\Delta t)}$
2. The (speed – time) graph for regular motion at uniform speed is represented by a.........................line parallel to the .... axis.

B. Write the scientific term:

1. The rate of change of speed of a moving body. (... ....)
2. A kind of motion in which the object's speed increases by time. (...)
3. A kind of motion in which the initial speed of a moving object is greater than the final speed. (...)
4. The change of the object's speed by equal values through equal periods of time. (...)

C. Give reasons for:

1. The object which moves at uniform speed, its acceleration equals zero.
....
....
2. It is said that the body moves at uniform acceleration.
....
....

D. Problem:

A car moves at speed 40 m/s, then the driver use the brake to stop the car through 20 seconds. Calculate the acceleration with which the car moves.
....



Unit one

Lesson three

Physical quantities (scalar and vector)

-It is necessary to deal with the physical quantities and mathematical relationship to understand the physical phenomena.

Physical quantities:

They are quantities that can be measured and have measuring units in our life.

Examples for physical quantities:

Mass, length, time, speed, force, energy, temperature, velocity, ………..etc.

Each physical quantity has its own measuring unit.

Types of physical quantities:

1. Scalars.

2. Vectors.

Scalar physical quantities:

It is physical quantity has magnitude only.

i.e. it is enough to know its magnitude only (numeric value and measuring unit) such as mass of the body 10 kg.

Scalar physical quantities	Its measuring unit
- Mass. - Length. - Speed. - Time. - Energy. - Temperature.	- Kilogram (kg). - Meter (m). - m/s km/h. - Second or hour. - Joule (j). - $°\text{F} \ or °\text{C}$



Vector physical quantities:

It is physical quantity has magnitude and direction**.**



- ***Vector physical quantities:***

  They are physical quantities that have magnitude and direction.

  - I.e. we need to know magnitude and direction to describe it.

Vector quantities	Acceleration	Force	Velocity	Displacement	Weight
Unit	m/s^2	Newton	m/s	Meter	Newton

Distance and displacement:

Displacement: it is the length of the shortest straight line between two positions (primary position and final position).

Distance: it is the actual length of the path that the moving body covers from the starting point to the ending point.

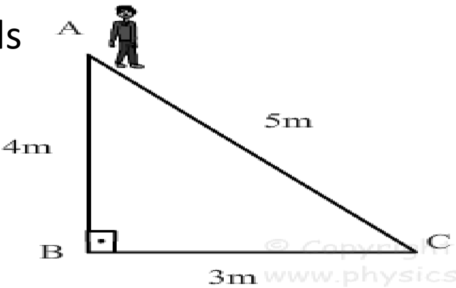
- ***Examples:***

1. When the boy moves from point (A) to the point(B) then to the end point (C) as shown .

The distance covered by the boy from A to C equals

= AB + BC = 4 + 3 = 7m.

The displacement from A to C = 5m in the direction $\vec{AC}$.



Note

-The distance = the displacement when the object moves in straight line in one direction.

Points of comparisons	Distance (d)	Displacement (đ)
Definition:	It is the actual length of the path that a moving body covers from the starting point to the ending point.	It is the shortest straight line between the starting and ending points.
It is determined by:	Magnitude only	Magnitude and direction.
Its kind:	Scalar quantity	Vector quantity.
Measuring unit	Meter or kilometer	Meter or kilometer.

Velocity: it is the rate of change of displacement.

Or it is the displacement covered in one second (unit time

P.O.C.	Speed	Velocity
Definition	It is the **distance** that is covered in one second. **OR** It is the **distance** moved through a unit time.	It is the **displacement** that is covered in one second. **OR** It is the **displacement** moved through a unit time in a specific direction.
It means	- It is a physical quantity that has **magnitude** but **not** a **direction**.	- It is a physical quantity that has **magnitude** & **direction**.
Measuring Units	• Meter/second • Kilometer/hour	• Meter/second • Kilometer/hour
The relation	It is the relationship between the **distance** and **time**.	It is the relationship between the **displacement** and **time**.
The law	$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$	$\text{Average velocity} = \frac{\text{Displacement}}{\text{Total time}}$



Exercise

A. Write a suitable word to complete the following sentences:

1. Speed, ……………………. and …………………… are examples of scalar physical quantities.
2. ……………………, …………………… and acceleration are from the vector quantities.

B. Write the scientific term:

1. The scalar quantity which is measure in m/s. (………………………………………)
2. The vector quantity which is measured in m/s^2. (………………………………………)
3. The vector quantity which measured in meter/sec. (………………………………………)
4. The rate of change of displacement. (………………………………………)

C. Give reasons for:

1. Distance is a scalar quantity.

……

……

D. Problem:

When a car moves from Cairo to Banha in a direct straight line with average velocity 30 km/h. Calculate the displacement of Banaha from Cairo, knowing that the time taken by the car to cover this distance is 1.5 hours.

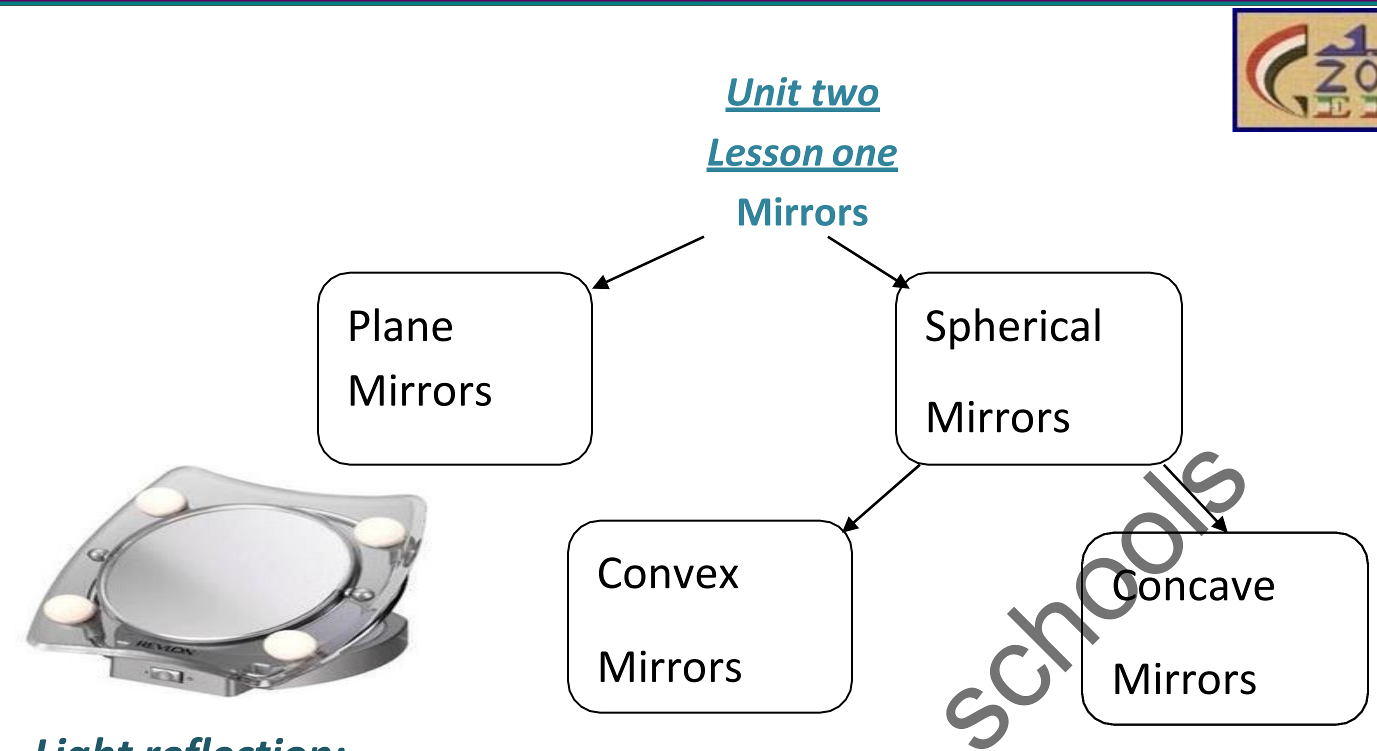
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Unit two

Lesson one

Mirrors



Light reflection:

It is the phenomenon of the light bouncing off in the same medium when it meets (strikes) a reflecting surface.

- ***First law:***

  Angle of incidence = Angle of reflection.

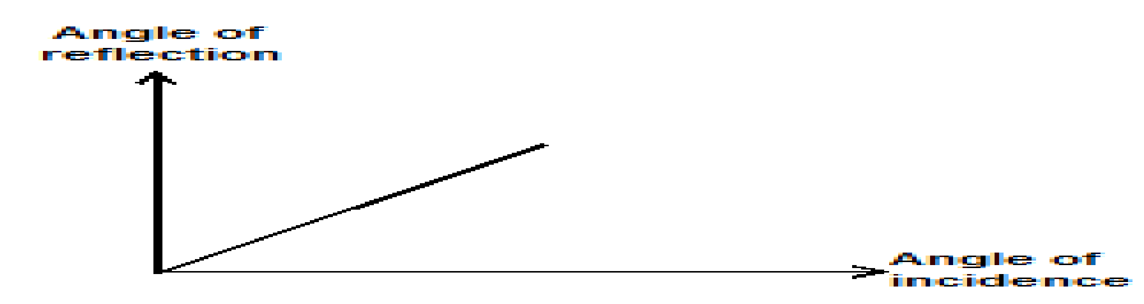
- ***Second law:***

The incident light ray, the reflected light ray and

the normal at the point of incidence lie all in the same plane perpendicular to the reflecting surface.

- The relation between the angle of incidence and the angle of reflection can be represented by the opposite figure.

(***direct relation***)



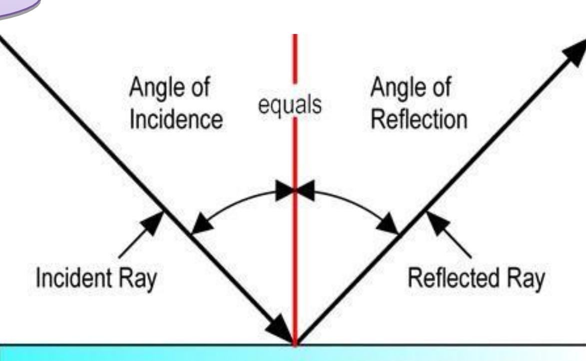


➢ Some concepts that related to light reflection:

➢ The incident light ray



➢ It is the light **ray** that **falls on** the **reflecting surface**.



➢ The reflected light ray

It is the light **ray** that **bounces** (returns back) **from** the **reflecting surface**.

Angle of incidence

It is the **angle between** the **incident** light **ray** and the **normal** (the line perpendicular to the reflecting surface at the point of incidence).

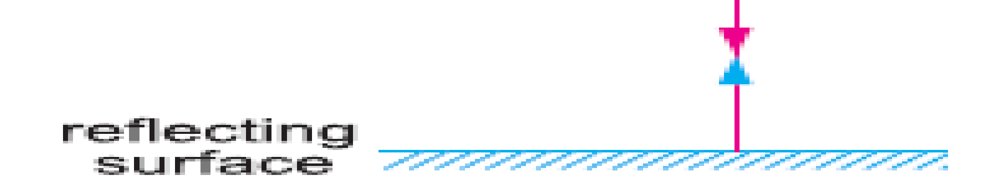
➢ Angle of reflection

It is the **angle between** the **reflected** light **ray** and the **normal**

Give reasons for:

The incident light ray which falls perpendicular on a reflecting surface reflects on itself.

Because the angle of incidence equal the angle of reflection equal zero.







- They are the reflecting surfaces for light.

1. Plane mirrors.

   is apiece of plane glass,painted from behindwith thin layer of silver to give the glass a bright surface that reflect most of incident light ray.

2. Spherical mirrors.

   a. Concave mirrors. b. Convex mirrors.

Properties of the image formed in the plane mirror:

❶ The image is **upright** (**erect**).

❷ The image is **equal** to the **object** in **size**.

❸ The image is **laterally inverted** (**reversed**).

❹The image is **virtual**. **(GR)**

Because it cannot be received on a screen and it is produced by the intersection of the extensions of incident and reflected rays.

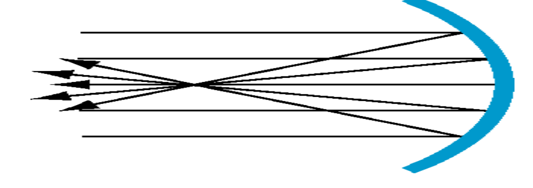
❺The **distance** between the **object** and the **mirror** is **equal** to the **distance** between the **image** and the **mirror**.

❻The **straight line** joining the **object** to its **image** is **perpendicular** to the **surface** of the **mirror**.

What is meant by spherical mirror?

It is the mirror that its reflecting surface is a part of a hollow sphere.

Types of the spherical mirrors:

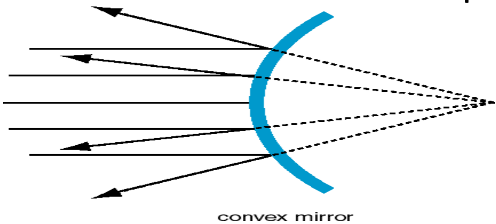


1. A concave mirror:

- A mirror its reflecting surface is a part of the inner surface of the sphere.
- It converges (Collects) light rays after reflection.

2. A convex mirror:

- A mirror, its reflecting surface is a part of the outer surface of the sphere.
- It diverges light rays after reflection.



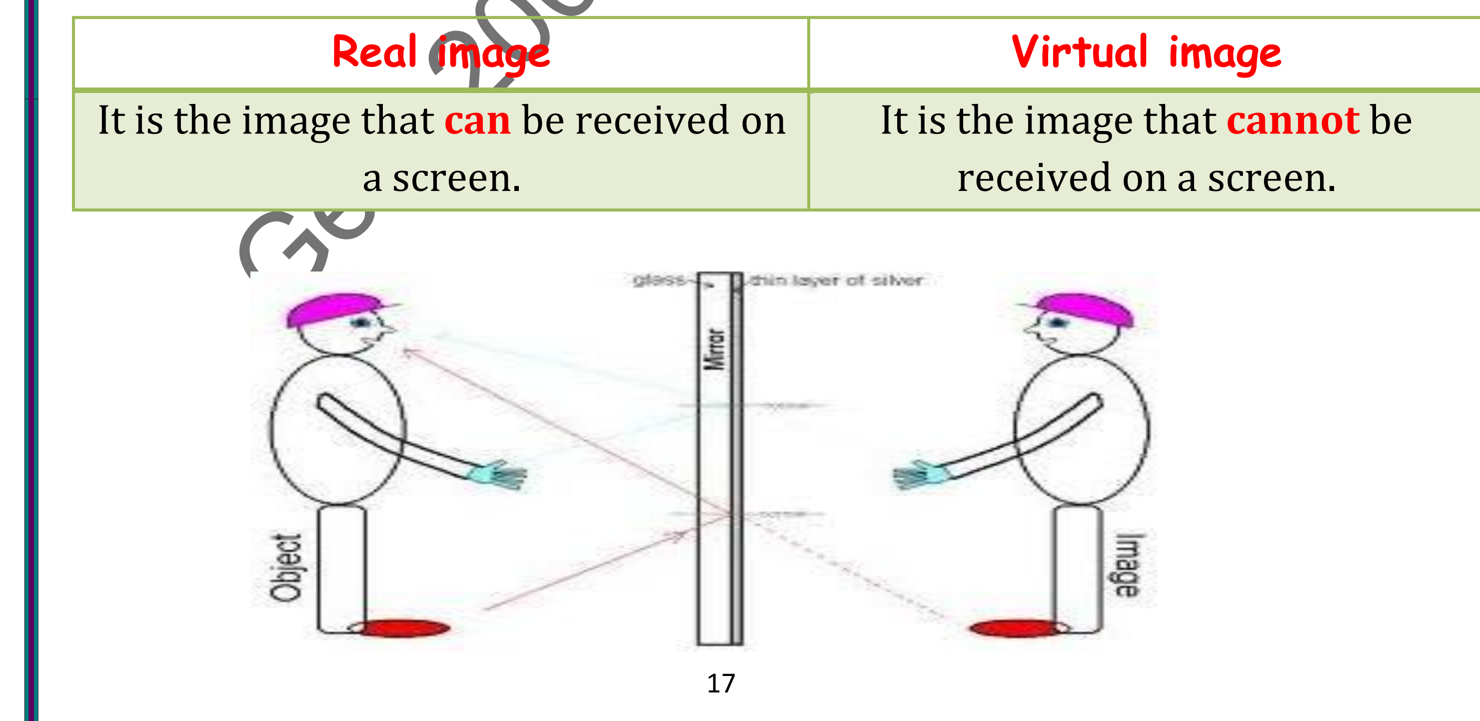




Concepts	Definition	Explanation fig.
1. Center of mirror curvature (C):	It is the center of the sphere that the mirror part of it: **Note:** - It is in front of the concave mirror. - It is behind the convex mirror.	C, Concave Mirror; C, Convex Mirror
2. Pole of the mirror (P):	It is the point that is the middle of the reflective surface of the mirror.	X, C, P, Y, Concave mirror; X, C, P, Y, Convex mirror; Midpoint of xy is P
3. Radius of mirror curvature (r):	It is the radius of the sphere that the mirror is a part of it.	R, C, Concave mirror; R, C, Convex mirror; Radius of Curvature
4. Principle axis of the mirror (CP):	It is the straight line that passes by the pole of the mirror (P) and its center of curvature (C).	Principal axis, C, P, Concave mirror; Principal axis, C, P, Convex mirror; Principal Axis

5. Secondary axis of the mirror:	It is any straight line that passes by the center of curvature of the mirror and any point on its surface except the pole of the mirror.	
6. Principal focus of the mirror (F):	It is the point of collection of the parallel rays after being reflected from the concave mirror. **OR** It is the point of intersection of reflected rays.	
7. Focal length of the mirror (f):	It is the distance between the focus of the mirror (F) and its pole (P).	

Real image	Virtual image
It is the image that **can** be received on a screen.	It is the image that **cannot** be received on a screen.



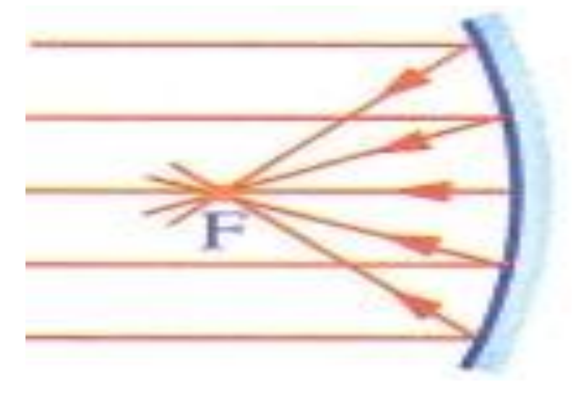


The path of the incident light ray	Explanation	The bath of the reflected light rays
1. Incident light ray parallel to principle axis		It reflects passing through The focus.
2. The incident light ray Passes through focus		It reflects parallel to the Principle axis.
3. The incident light ray Passes by the center of Curvature (C)		It reflects on itself.

<u>The cases of the formation of images by the concave mirror:</u>

1. The object is very far (the incident rays are parallel to the principal axis):

- ✓ **The position of the object:** - Very far
- ✓ **The position of the image:** - At the focus
- ✓ **The properties of the formed image:**
  - Real
  - Very tiny (dot)

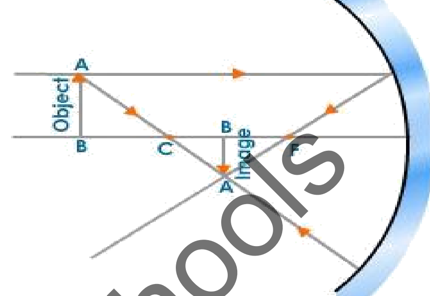




2. The object at a distance greater than the double of focal length:

- ✓ **The position of the object: -** At a distance greater than the double of focal length.
- ✓ **The position of the image: -** At a distance greater than the focal length, but less than the double of focal length.

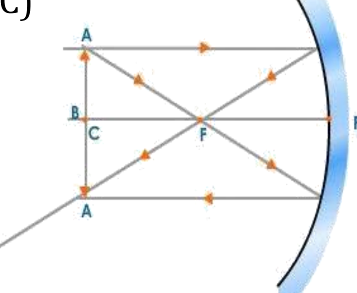
(between the focus and the center of curvature)



- ✓ **The properties of the formed image:**
  - Real
  - Inverted
  - Small (diminished)

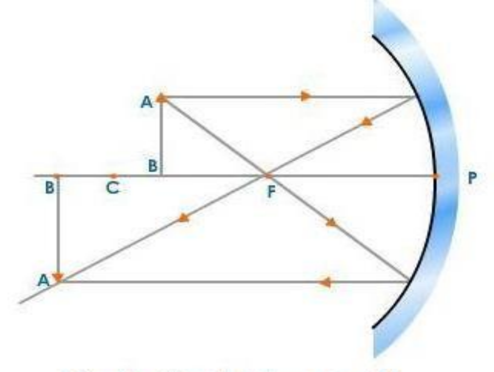
3. The object at a distance greater than the focal length, but less than the double of focal length (between the focus and the center of curvature):

- ✓ **The position of the object:** - At the center of curvature(C)
- ✓ **The position of the image:** - At the center of curvature.
- ✓ **The properties of the formed image:**
  - Real
  - Inverted
  - Equal to the object



When the Object is Placed at the Centre of Curvature

4. The object at a distance greater than the focal length, but less than the double of focal length (between the focus (F) and the center of curvature (C))



When the Object is Between C and F

- ✓ **The position of the object: -** Between the focus (F) and the center of curvature (C).

(at a distance more than the focal length but less than radius of curvature)

- ✓ **The position of the image: -** After the center of curvature.
- ✓ **The properties of the formed image:**
  - Real
  - Inverted
  - Magnified



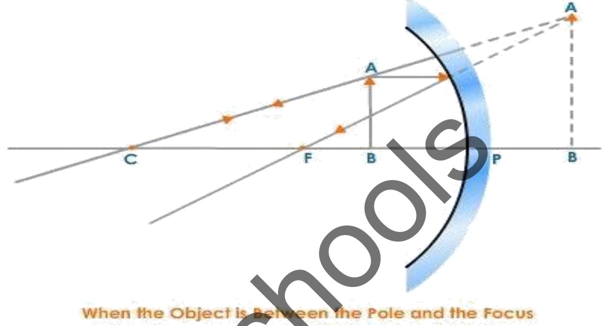
5. The object at a distance less than the focal length. (before the focus):

✓ **The position of the object:** - Between the focus (F) and the pole (P).
(at a distance less than the focal length)

✓ **The position of the image:** - Behind the mirror.

✓ **The properties of the formed image:**

- Virtual - Inverted
- Magnified



When the Object is Between the Pole and the Focus

- **Radius of mirror curvature (r) = 2f**
- **Focal length = $\frac{1}{2}$ r**

Uses of the concave mirror:

1. As a torch to reflect light.
2. In front lights of the car to reflect light.
3. In shaving. 5-In light houses to guide ships.
4. In solar ovens.6-In air crafts landing at airports

Uses of the convex mirrors:

1. Convex mirror is used as side-view mirror on the passenger's side of a car (G.R.)
   Because if forms an erect and smaller image for the way behind the car.
2. Convex mirror is suitable for convenient shop, and big supermarket and any other corner where need anti-thief.
3. Convex mirror is used in the turning off the road and parking.





Properties of image formed by convex mirror:-

1- virtual **2- erect (upright)** **3-diminished**

Exercise

A. Write the scientific term:

1. The angle between incident ray and the line perpendicular on the reflectingsurface. (. ....)
2. A mirror who's reflecting surface is the inner surface of a sphere and convergesthe light rays. (. ....)
3. Angle of incidence = angle of reflection. (. ....)
4. A point that is in center of the reflective surface of the spherical mirror. (......................................)
5. The straight line that passes by the center of curvature of the mirror and anypoint on its surface besides the pole of the mirror.........................(.)

B. Give reasons for:

1. The image formed by a plane mirror is virtual.

....

....

2. The convex mirror is called diverging mirror.

....

....

C. Problem:

1. A person stands in front of a plane mirror at a distance of 25 meters. Calculatethe distance between the person and his/her image.

....

....



Unit two

Lesson two Lenses

The lens:

It is a transparent medium that refracts the light and is limited with two spherical surfaces.

- They are made of glass or plastic.

Uses of lens:

1. In medical eye glasses either for reading or walking.
2. Magnifying lens used in fixing watches.
3. Used in binoculars to follow battles.
4. Making of some sets projectors, camera and magnifying lens.

5-Making telescope to get enlarged and near image for celestial bodies. 6-Making microscope to form magnified image for tiny bodies

Types of lenses:

1. Convex lens;

- **It is thick at the center and less thickness at the tips.**
- **It collects light rays falling on it (Converging lens)**

2. Concave lens;

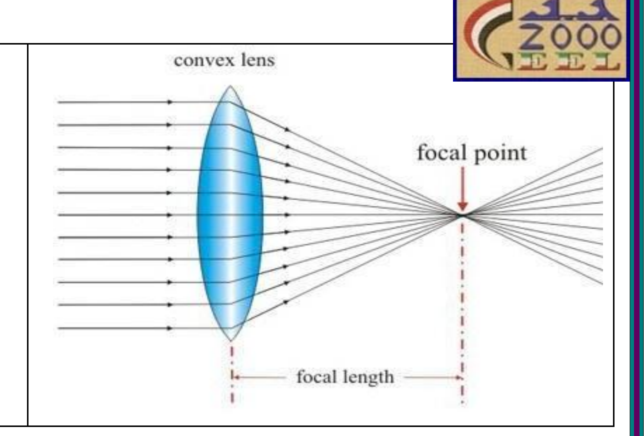
- **It is thin at the center and thick at the two tips.**
- **It separates light rays, so it is called (diverging lens)**





Special concepts related to the lenses:

Concepts	Definition	Explanation fig.
1. Center of curvature of the lens face (C):	It is the center of the sphere that this face is a part of it: e.g. C_1 & C_2	The principal axis, C_2, P, C_1
2. The optical center of the lens (P):	It is the point inside the lens placed on the principal axis in the mid distance between its face.	
3. The principal axis:	It is the line between the two centers of the lens passing by the optical center of the lens.	The principal axis, C_2, P, C_1
4. The radius of curvature of the face of the lens (r):	It is half the diameter (radius) of the sphere that this face is a part of it.	
5. The secondary axis:	It is any line passes by the optical center of the lens except the principal axis.	Secondary axis
6. The focus of the lens (F):	It is the point of collection the parallel light rays after refraction from the lens.	F

7. The focal length of the lens (f):	It is the distance between the focus and optical center of the lens. $f = \frac{1}{2} r$	

G.R. The lens has two centers of curvature (has two foci).

Because it has two spherical surfaces.

A. Convex lens;

Rules of determination the direction of the light rays after passing through the convex lens:

The path of the incident light ray	Explanation	The bath of the refracted light rays
1. The incident light ray Passes through focus	3 F` C F	It refracts parallel to the Principle axis.
2. Incident light ray parallel to Principle axis		It refracts passing through The focus.
3. The incident light ray Passes by the optical center of the lens	1 F` C F	It passes without refraction

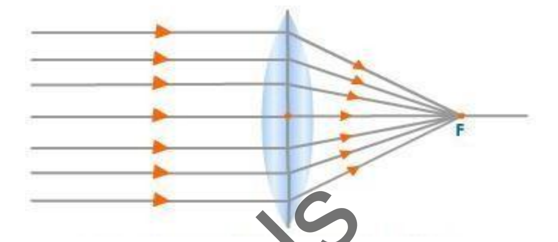


A-The cases of the formation of images by the convex lens:

1.The object is very far (the incident rays are parallel to the principal axis):

The position of the object: - Very far

The position of the image: - At the focus



The properties of the formed image:

- Real
- Very tiny (dot)

3. The object at a distance greater than the double of focal length:

The position of the object: - At a distance greater than the double of focal length.

The position of the image: - At a distance greater than the focal length, but less than the double of focal length.(between the focus and the center of curvature)

The properties of the formed image:



- Real
- Inverted
- Small (diminished)

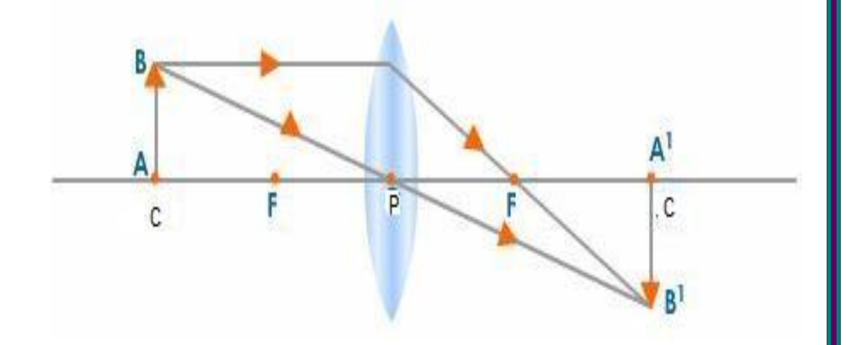
4. The object at a distance greater than the focal length, but less than the double of focal length (between the focus and the center of curvature):

✓ **The position of the object: -** At the center of curvature (C)

✓ **The position of the image: -** At the center of curvature.

✓ **The properties of the formed image:**

- Real
- Inverted
- Equal to the object





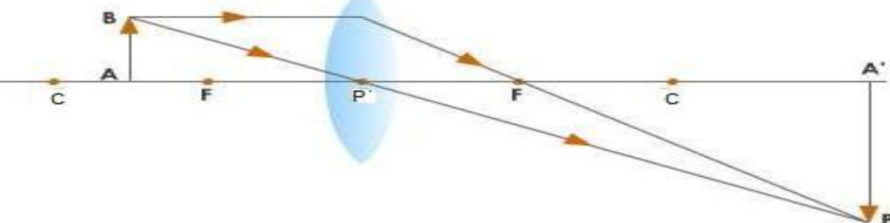
5. The object at a distance greater than the focal length, but less than the double of focal length (between the focus (F) and the center of curvature (C))

The position of the object: - Between the focus (F) and the center of curvature (C).

The position of the image: - After the center of curvature.

The properties of the formed image:

- Real
- Inverted
- Magnified



6. The object at focus.

The position of the object:

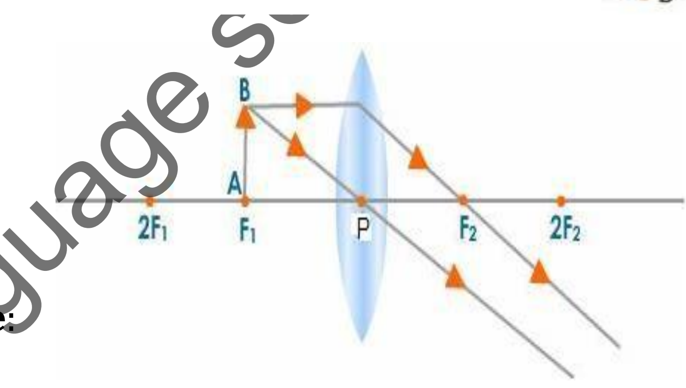
- At the focus (F).

The position of the image:

- No image is formed.

The properties of the formed image:

No image is formed.

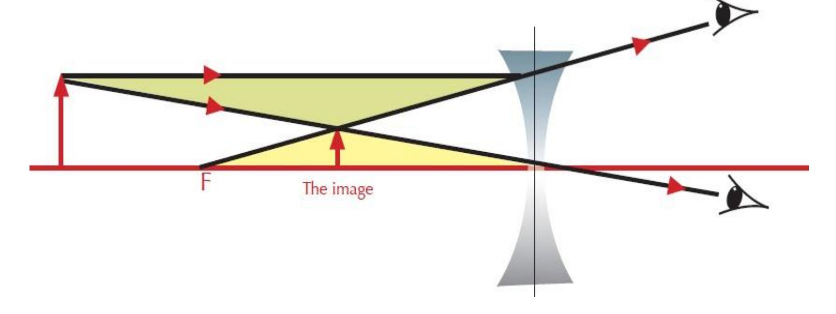


The properties of the formed image by the concave lens:

✓ **The position of the object:**
- In front of the concave lens.

✓ **The position of the image:**
- Before the object in the same side.

✓ **The properties of the formed image:**
- Virtual
- Erect
- Small





The real image	The virtual image
1. It is formed due to the intersection of the reflected or refracted light rays.	1. It is formed due to the intersection of the extensions of the reflected or refracted light rays.
2. It can be received on a screen.	2. It cannot be received on a screen.
3. It is always inverted.	3. It is always erect (upright).
4. It is larger or smaller than the object.	4. It is larger, smaller or equal to the object.

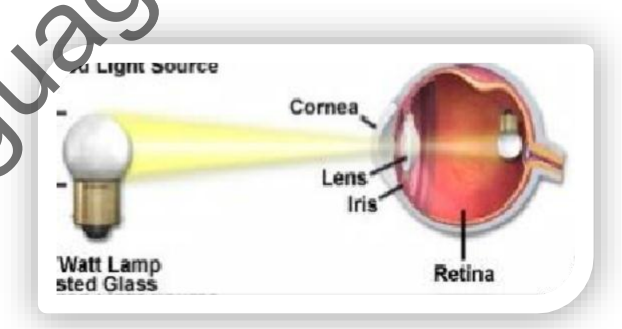
- ***Applications on lenses:***

Telescopes: they are used for formation of enlarged images for the heavenly bodies.

Microscope: they are used for formation of magnified images of tiny images.

The vision:

When the light falls on any object then return back to the eye, it can see the object.



Notes:

1. The diameter of the eyeball is the distance between the optical center of the lens and the retina.
2. To see image clearly, the image must be formed on the retina.
3. The normal person can see clearly:
   a. Near objects (at distance not less than 25cm)
   b. Far objects (at distance up to 6 meters)

Treatment of vision defects:

1. Short sightedness:

The vision defect through which near objects can be seen clearly but far objects seem distorted.

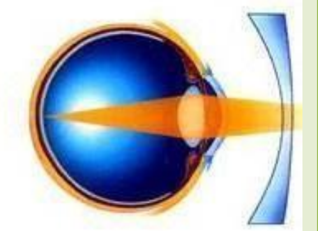


2. Long sightedness:

The vision defect through which far objects can be seen clearly but near objects seem distorted.

P.O.C.	Short - sightedness	Long - sightedness
Definition	It is a vision defect through which **near** objects **can** be **seen clearly** but **far** objects **seem distorted** (not seen clearly). **G.R.** Because the images of **far** objects do **not fall on** the **retina** of the eye but **in front of it**.	It is a vision defect through which **far** objects **can** be **seen clearly** but **near** objects **seem distorted** (not seen clearly). **G.R.** Because the image of the **near** objects do **not fall on** the eye retina but **behind it**.
Image		
The reason	**1. The increase in the eyeball radius** **(**Shortness in the eye sphere**).** This causes the retina is **far from** the eye **lens**. **2. The increase of convexity of the eye lens surface** **(**the surface of the eye **lens** is **more convex)**. This result in a **smaller focal**	**1. The decrease of the eyeball radius** **(**Longest in the eye sphere**).** This causes the retina is **close to** the eye **lens**. **2. The decrease of convexity of the eye lens surface** **(**The surface of the eye **lens** is **less convex)**. This result in a **long focal**



	length of the eye **lens**, then the **parallel rays** coming **from** the far **object** is **collected** at a **point in front** of the **retina** and **disperses after** that forming an **unclear** image **on** the **retina**.	**length** of the eye **lens**, then the **parallel rays** coming **from** the near **object** is **collected** at a **point behind** the **retina** and **disperses after** that forming an **unclear** image **behind** the **retina**.
Correction	By using a **concave** lens which **disperses** the rays to form **diverge** image of the objects on the retina. **Therefore**, short-sighted person needs a medical eye **glasses** with **concave** lenses.	By using **convex** lens which **collects** the rays to form **visual** images of the objects on the retina. **Therefore**, the long-sighted person needs a medical eye **glasses** with **convex** lenses.
Image	 	 

Cataract: one of the most dangerous diseases makes eyes lens become dark.

Reasons: old age – illness – side effects of the drugs – genetic readiness.

Treatment: done by surgery to exchange the lens of the eye with plastic lens.

Exercise

A) Write the scientific term for each:

1. **Transparent medium that causes light refraction. (..)**
2. **The image that is formed due to the collection of refracted light rays and can bereceived on screen. (..)**
3. **Lens that diverge light rays fall on it. (..)**
4. **Any line that passes through optical center except the principal axis. (..)**
5. **Disease infects eye lens so that it becomes dark. (....)**

B) Put(√) or (X) in front of the following:

1. **The incident light ray that passes the optical center passes without any reflection. ( )**
2. **The body found at the focus in front of convex les has no image. ( )**
3. **Each lens has only one center of curvature. ( )**
4. **The convex lens is a converging lens. ( )**

C) Give reasons for each:

1. **The collective lens has two foci while the collective mirror has only one.**
   ....
   ....
2. **The object that is placed at the focus of the convex mirror has no image.**
   ....
   ....
3. **It is impossible to obtain real image by concave lens.**
   ....
   ....



Unit three

Lesson one

The universe

The universe:

It is the wide and extended space that contains all the galaxies, stars, planets, moons, living organismsand everything.

- **It contains about 100000 million galaxies.**
- **It is very vast.**

Galaxies:

They are groups of stars that rotate together in cosmic space by the effect of gravity.

- Each galaxy has a distinctive shape according to the harmony and order of the stars in it.

The galaxy to which our solar system belongs is the milky way

Clusters of galaxies:

They are groups of galaxies that rotate together in cosmic space by effect of gravity.



Milky Way galaxy:

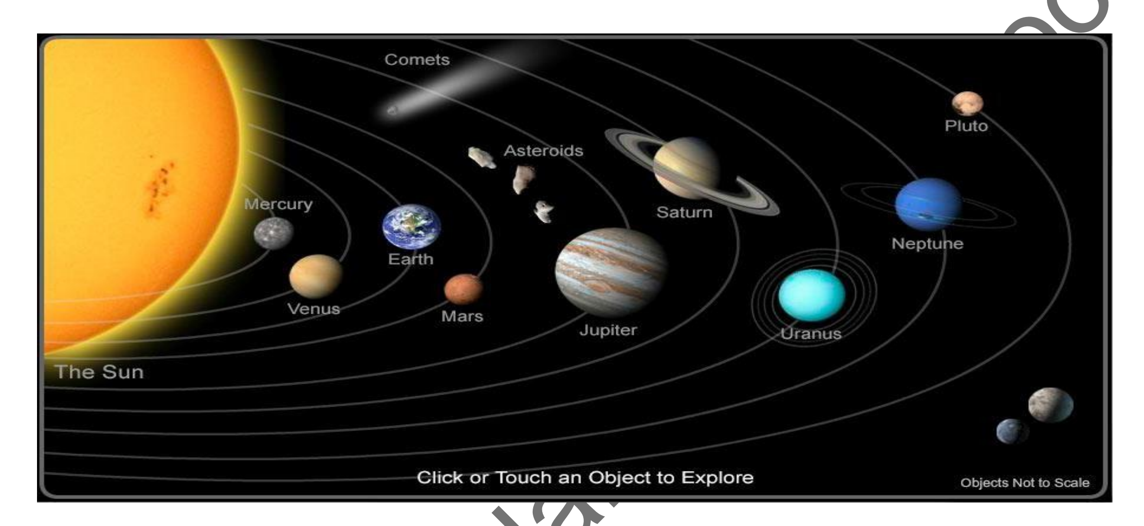
- **The old (large) stars gather in the center.**
- **The recent small stars are located on the spiral arms of the galaxy.**
- **Milky Way galaxy was given that name as it appears in the sky as splashing milk.**
- **Milky Way galaxy contains all the stars that we see in the sky.**



The solar system:

It is the sun and eight planets revolve around it.

- **It is located at one arm of the spiral arms of Milky Way galaxy.**
- **The sun takes about 220 million years to make one complete rotationaround the center of the galaxy.**
- **Earth is one of the planets that revolve around the sun.**
- **Earth is the planet of life.**
- **To measure the distances through the universe we use Light year.**



Light year: It is the distance that the light covers in one year and it equals about 9.467×10^{12} km.

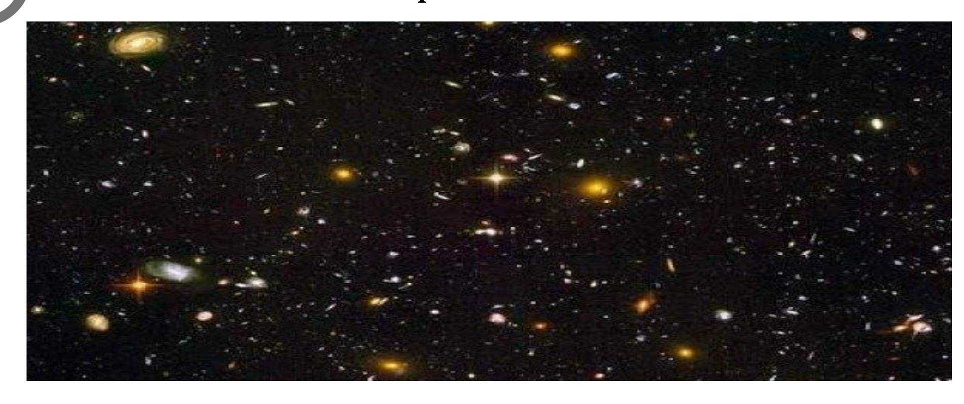
Expansion of the universe:

- It is continuous separation between galaxies in space

Distances between galaxies increases as time passes, as galaxies move

Conclusion:

The universe is in continues expansion.





The Big bang theory

Since about 15000 million years, the universe was very small and very hot.

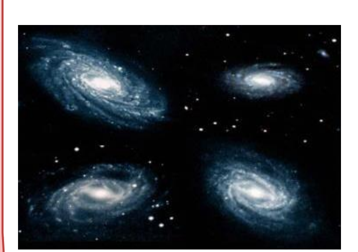
1

Big bang

- Within minutes, the universe was formed containing **75%** hydrogen and **25%** helium.
- Temperature was about 10**,000** million degrees.
- Matter got joined in masses after **1000 million** years of the Big Bang.



- The universe was almost formed in homogeneous parts. But with the expansion process, matter started to merge in masses inside it.
- The gravity helped in the gathering of more masses leaving areas of empty space between them. At the end, areas of the gathering of matter produced stars and galaxies.



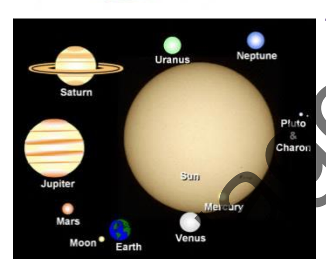
2

- Ancestral galaxies were evolved within **2000** to **3000 million** years of the Big Bang



3

- Our galaxy, the Milky Way, took its disc form after **5000 million** years of the Big Bang of the Big Bang



4

- The Sun was born after **10,000 million** years of the Big Bang and then the Earth and planets were created.

5

- Earliest life forms began to appear on earth after about **12,000 million** years of the Big Bang.



6

- The present universe is formed after **15,000 million** years of Big Bang.



Scientific ideas about the evolution of the solar system:-

❶ Nebular theory

❷ The crossing star theory.

❸ The modern theory.

Theories that explain the origin of solar system:

1. Laplace theory (nebular theory) (1796)

****-The solar system was a glowing gaseous sphere revolving around itself in a sphere called Nebula.***

****-The gaseous rings:***

a-Under the effect of centrifugal force, the nebula lost its spherical shape and became in a form of flat rotating disc.

b- Parts got separated from the flat disc.

c-The gaseous rings cooled down and frozen forming the planets of the solar system.d-The flaming mass that remains at the center forms the sun.

2-*Crossing star theory [Chamberlain andMoulton* (1905)

- **Solar system where originally the sun.**

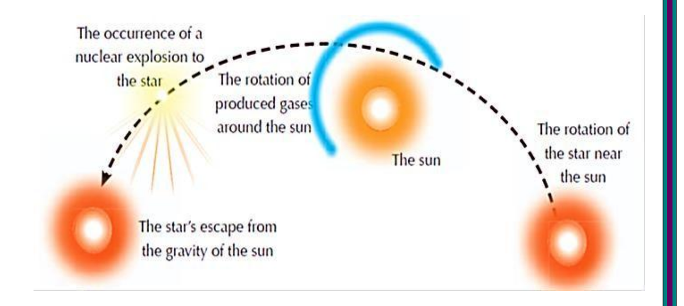
1. **A huge star approached to the sun.**
2. **This star attracted the sun to it that led to great expansion to the sun in the part facing the sun.**
3. **The sun escaped from that star.**
4. **The gaseous line started to condense thenforming planets.**

2. *The modern theory of the world:* (1944)

1-A star was rotating near to the sun.

2-The star exploded due to huge nuclearexplosion.

3-This cloud subjected to cooling and contraction and form the planets.



The important instrument to study the outer space



1- **Solar telescope:-** It is centered on the earth.

It forms a picture for the sun

It works on reflecting the sun rays in downward to a concave mirror in a tunnel under the earth surfacethe sun light is gathered then separated into a solar spectrum by spectrometer. A picture of the sun is formed in a monitoring room where astronomer can study its light.

The Hubble telescope was launched in April in 1990 it rotates around the earth at height of 500 km It collects photos for the universe that gives us details about its state since millions of year it gives opportunity to study the evolution of the universe after the big bang.

Exercise

A) Complete the following statements:

1. Galaxies are group of ………………… that rotate together in the space by the effect of …………………………………..
2. The galaxy where planet earth is found is ……………………………………….
3. ………………………is a group of galaxies found together.

B)Write the scientific term:

1. It is a wide and extended space that contains galaxies. (…………………………………………)
2. The bigger units that form universe. (…………………………………………)
3. It contains all the stars that we see in the sky. (…………………………………………)
4. It is located on one arm of the arms of the Milky Way galaxy. (…………………………………………)
5. The unit that is used to measure distances between stars and galaxies in the universe. (… ……………………………………)

6.A theory assumed that solar system was originally a star rather than the sun. (………………………………………………)

C) Give reasons for;

1. The continuous separation (expansion) of the space.

………

………



Unit (4)

Lesson one
Cell Division

- The cell is the building unit of living organisms.

Types of living organisms

- **Unicellular organisms**
- **Multicellular organisms**

Types of cells in multicellular organisms

❶ Somatic cells

- They are all body cells except reproductive cell Cells of (liver – skin – kidney) in animals and human
- The cells of (roots – stem – leaves) in plants.

Divided by:

Mitosis

1. The growth of living organisms.
2. Compensation of the damaged cells.

❷ Reproductive cells

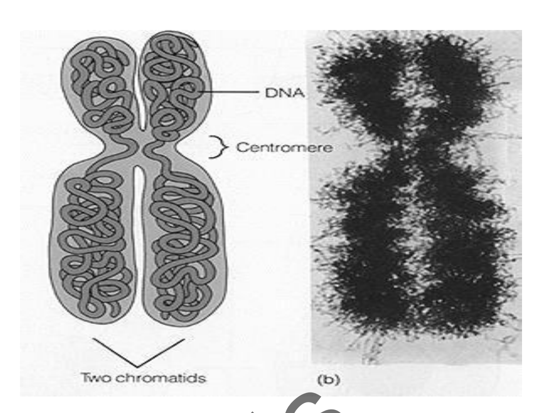
- Testis and ovary cells (human and animals)
- Anther and ovary cells (plants)

Divided by:

Meiosis

1. Formation of male and female gametes which are responsible for reproduction in living organisms.
2. Transfer of genetic traits from parents to their offspring.





Chromosomes:

- ***It consists of:***
- Two connected threads, each thread is called **Chromatid.**
- The two threads are connected at a point called **Centromere**
- **Chemical structure:**



Each chromatid formed of nucleic acid called (DNA) that carries genes

➢ **The number of chromosomes in living organisms:**

a. Different from one species to another.
b. Fixed in the members of the same species.

➢ **Somatic cells contain two sets of chromosomes (diploid 2N), while in gametes**

➢ **is a (haploid N).**

In human the somatic cells contain 46 chromosomes in each cell, while the genetic cells contain only 23 chromosomes.

Types of cells division

❶ Mitosis cell division (indirect cell division)	❷ Meiosis cell division (reduction cell division)

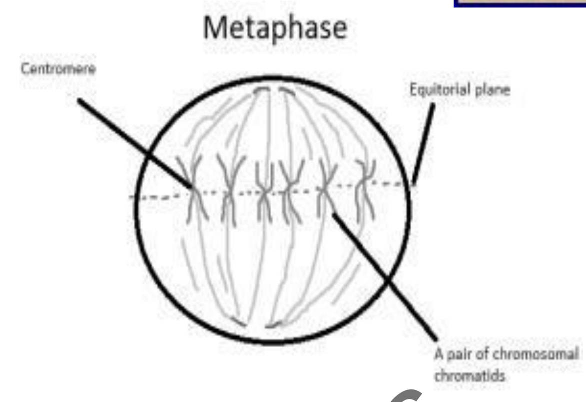
Mitosis

Occurrence: **it occurs in the somatic cells (all body cells except reproductive cells).**

Importance:

a. **Growth of the living organisms (animals and plants).**
b. **Completing the asexual reproduction.**
c. **Compensate the missing parts of some organisms.**





Phases of mitosis:

- Before the cell starts the cell division the cell passes through **interphase**, in which the cell prepares itself for division by:

a. Duplication of the amount of DNA.

b. Some important processes occur.

1. *Prophase*:

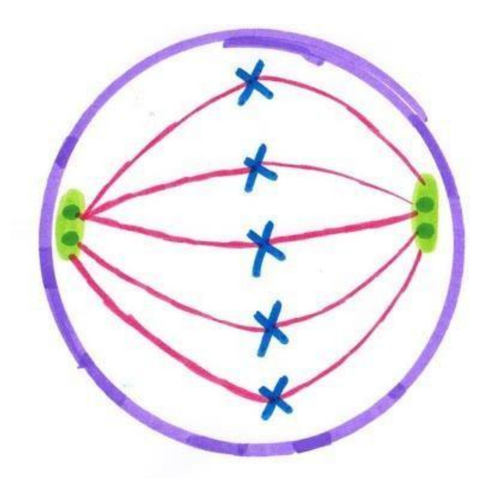
- **Chromatin reticulum condenses then appears in the form of long, thin and double strings (chromosomes).**
- **Network of filamentous fibers called (spindle fibers) are formed extending between two pole of the cell.**
- **The nucleolus and nuclear membrane disappears.**
- **Note:**

a. In animal cell spindle fibers formed by centrosome.

b. In plant cell spindle fibers formed by cytoplasm.

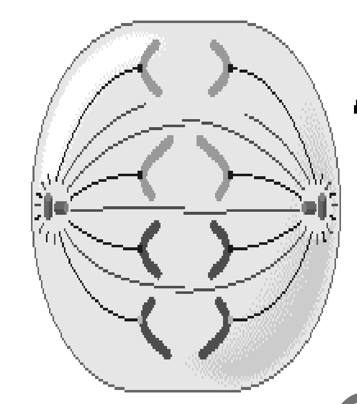
2. *Metaphase:*

- The chromosomes connected to spindle fibers are arranged along the cell equator.





3. *Anaphase:*



Anaphase
The chromosomes have separated and are moving toward the poles.

- The centromere of the chromosomes split lengthwise into two halves, so the chromatids separate from each other.
- Spindle fibers begin to shrink and two identical groups of chromosomes
- are formed each group of chromosomes migrate to one of the cell's poles.

4. Telophase:

- The spindle fibers disappear.
- A nuclear membrane is formed at each pole of the cell to form two nuclei one at each pole.
  - At the end of this phase the cell divides into two new cells each one contains (2N) chromosomes.



Telophase
The chromosomes are at the poles, and are becoming more difuse. The nuclear envelope is reforming. The cytoplasm may be dividing.

Meiosis

1. *Meiosis:*

Occurrence:

It occurs only in the reproductive cells.

- In human and animals:
  a. It occurs in testis to make male gametes.(sperms)
  b. It occurs in ovary to make female gametes. (ova)



Importance:

- Production of male and female gametes to complete sexual reproduction.

Phases of meiosis:

1. **First meiotic division.**
2. **Second meiotic division.**

A. ***First meiotic division:***

- It produces two cells each one of them contains half the number of chromosomes.

Prophase I:

1. Chromatin reticulum condenses and appears as chromosomes.
2. Chromosomes are arranged in homologous pairs, each pair formed of four chromatids. (**Tetrads).**
3. Crossing over phenomenon occurs
4. Nuclear membrane and nucleolus disappear.
5. Each two homologous chromosome in the tetrads move away from each other spindle fibers appears and connect to chromosomes at centromere.

6. ***Crossing over phenomenon:***

It is the phenomenon that takes place at the end of the prophase I and in which some parts of the two inner chromatids of each tetrad are exchanged to produce new genetic arrangements.



***Importance of the crossing over phenomenon**

- Variation of genetic traits among the members of the same species

Metaphase I:

Chromosomes pairs arrange at the cell equator.

Anaphase I:

1. **The spindle fibers shrink, so every two homologous chromosomes move away from each other.**
2. **One of the two chromosomes migrates towards the cell pole and the other migrates towards the other pole.**
3. **Each pole of the cell contains half the number ofchromosomes of the parent cell.**



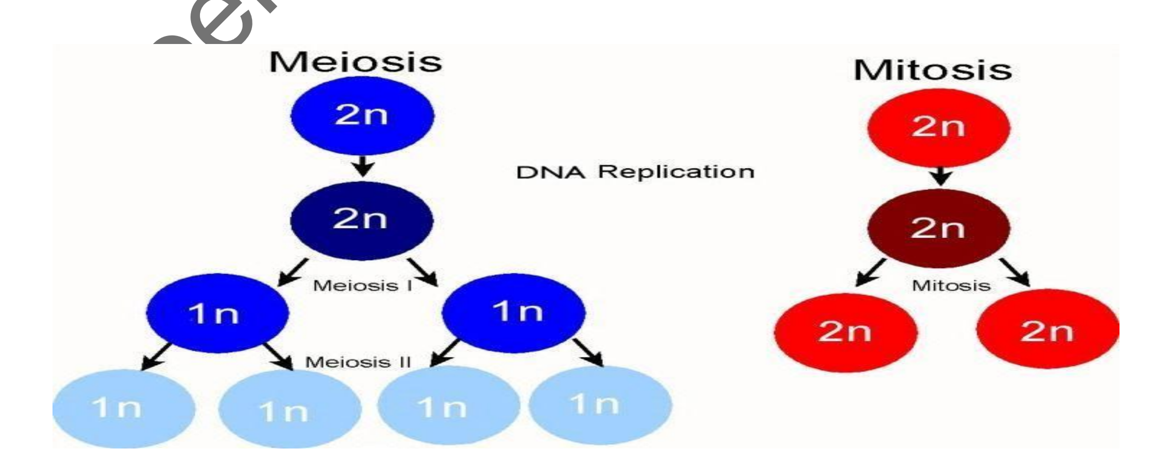
Telophase I:

1. **The spindle fibers disappear.**
2. **A nuclear membrane is formed at the poles of the cell, leading tothe formation of two nuclei.**
3. **Each cell contains half the number of the original chromosomes.**

Second meiotic division:

-It aims to increase the number of the produced cells from the first meiotic division.

-At the end it produces 4 cells of half the number of chromosomes (haploid).





Nano technology and cancer treatment

***Cancer** occurs when the body cell are divided without controlling, the mass resulted from this divisionis called **tumor**

***- Dr. Mustafa El said** discovered away to detect the cancer and kill by using small of gold measured bynanometer by technic called Nano- technology which used in:-

1- discovering cancer

by loading proteins with Nano molecules of gold and then injecting them into the patient, these molecules passthrough the blood and attach on the cancerous cell surface to monitor it through microscope.

2-Treatment of cancer

a- By using Nano- molecules of gold

By focusing laser to the gold molecules then these molecules absorb light and convert it into heat which burn and kill these cell.

b- By using developed microscopes bombs

By using smart microscopic bombs that penetrates the cancer cells and explode them from inside.

Exercise

A) Write the scientific term of the following:

1. They are thread like structures that have the main role of cell division.
   (… ………………………………………)
2. It consists of two chromatids connected together at centromere.
   (… ………………………………………)
3. The nuclear acid that carries the genetic materials.
   (… ………………………………………)
4. The cellular division that leads to the formation of gametes.
   (… ………………………………………)
5. Phase in which the chromosomes migrate to the equator of the cell.
   (… ………………………………………)
6. Fibers that extend from each pole of the cell in the prophase.
   (… ………………………………………)

B) Give reasons for each of the following:

1. Cellular division begins with interphase.
   ……………………………………………………………………………………………
   ……………………………………………………………………………………………

2-Crossing over is the source of genetic variation on between members of the same species.
……………………………………………………………………………………………
……………………………………………



Unit four

Lesson two

Sexual and asexual reproduction

Reproduction process:

It is the biological process, where the living organism produces new individuals of the same kind to ensure it continuity.

Types of reproduction

❶ Asexual reproduction	❷ Sexual reproduction
1.It occurs by only **one** living organism. 2.It mostly occurs in single-celled living organisms. (Such as budding in a yeast and binary fission in Amoeba.)	1. It occurs through **two** living organisms, (one of them is a male and the other is a female.) 2. It occurs in higher living organisms of plants and animals.

➢ **Asexual reproduction:**

It is the process by which living organisms produce new individuals with genetic traits identical to those of their parents.

It occurs in:

- Unicellular living organisms.
- Some multicellular animals and plants.
- It takes place with mitosis.

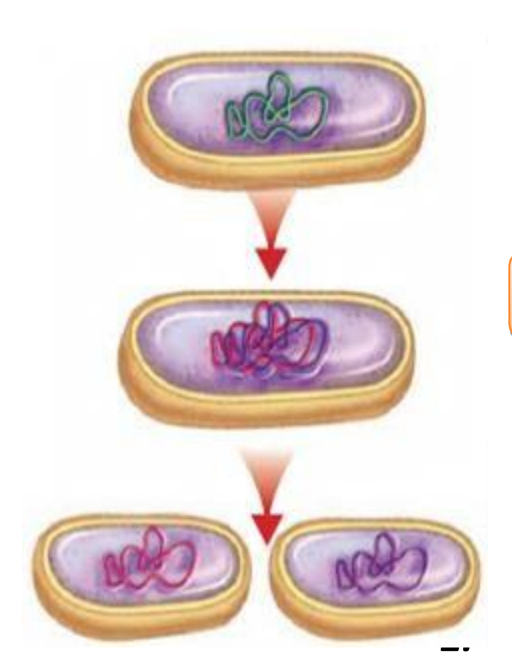
Types of reproduction

Binary fission	Budding	Regeneration	Spore propagation	Vegetative reproduction

1. **Binary fission:**

It occurs in unicellular living organisms as:

Unicellular protozoan (Amoeba – paramecium – euglena)Simple algae and bacteria.

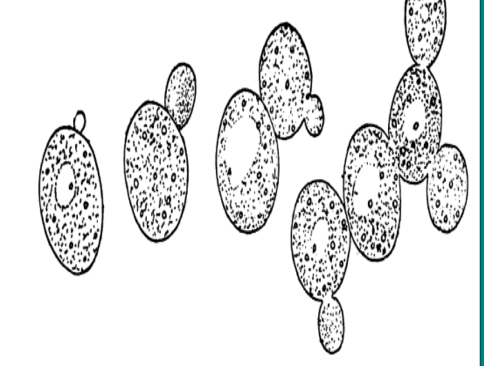


Bacterial cell

The genetic material doubles

Two identical cells are produced، each is identical to the original

3. **Budding:**



-It occurs in unicellular living organisms (yeast fungus)

-Multicellular living organisms (Hydra and sponges)

-It is asexual reproduction produces new individuals by formation of buds in the parent cell.

4. **Regeneration:**

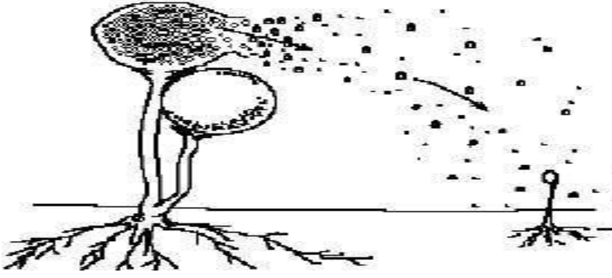
It is the ability of animals to compensate their missing parts.It occurs in some animals (such as starfish).



It occurs by mitosis if the part of this bodyhas part of central disc.(2N)

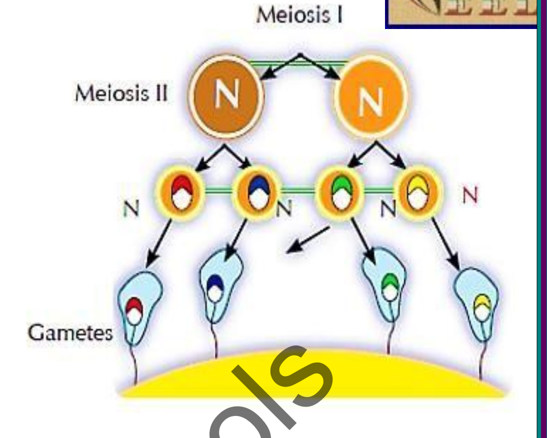
5. **Sporogony (spore propagation):**

It occurs in: some fungi such as bread mold mushrooms and some algae.



6. Vegetative reproduction:

It is an asexual reproduction by using vegetative organs except seeds.



B. Sexual reproduction:

It is the process by which living organisms produce individuals with traits differ from the parents.

It occurs by two ways:

a. Gametes formation **b. fertilization.**

Fertilization: **It is the combination of the male gamete and female gamete to form**

***A zygote** **contains the normal number of chromosomes of the organism.**

Sexual reproduction is a source of genetic variation:

Two sources male and female parents.

- This means that the resulted offspring have new genetic traits that combine the parent's traits.

Thus, sexual reproduction is a source of genetic variation.



Exercise

1- *Complete the following statements:*

1- Binary fission , budding, --------,--------and vegetative reproduction are the types of asexual reproduction.

2- During asexual reproduction, the number of parents is -------, while it is -----------during sexual reproduction.

2- The yeast fungus reproduces by budding which is considered as a type of ---------reproduction.

3- Starfish reproduces asexually by -------------, while bread mould fungus

4- reproduces by ----------------

5- Sexual reproduction depends on two main processes that are ------------ and...........

2- Put (X) or (√), then correct the false ones :

1- The unicellular protozoan reproduce by binary fission. ( )

2- Sexual reproduction maintains the genetic structure of the living organisms. ( )

3- Amoeba is divided by the binary fission into two identical cells, each is similar to the parental cell. ( )

4- The asexual reproduction produces living organisms similar in their genetic structure. ( )

5- the starfish reproduces by regeneration. ( )

3- Give reasons for:

1- Sexual reproduction is a source of the genetic variation between individuals.

....

2- Asexual reproduction produces offspring with genetic traits identical to those of their parents.

....

Model exam 1

Question 1:

A) Choose the correct answer:

1. Displacement is a physical quantity and its unit is ……………..
a. meter/second b. meter/second^2 c. meter

2. The image of the object formed by a plane mirror is ……………..
a. equal to the object b. larger than the object c. smaller than the object

3. Reproduction by spores occurs in all of the following organisms except ……….
a. starfish b. bread mold c. algae

4. The two gases which produced galaxies, stars and universe through millions of years are ………………
a. oxygen and helium
b. hydrogen and carbon dioxide
c. hydrogen and helium.



B) What happens when….?

1. A light ray is incident parallel to the principal axis of the concave mirror.
2. The observer moving in his car with the same speed and direction of another car.
3. Combination of the male gamete and female gamete.

Question 2:

A) Complete each of the following:

1. *The scientist who established the modern theory of the world is………………*
2. *Mitosis occurs in the…….......cells of organisms.*
3. *A bus is moving on a straight line, its speed changes from 6 meters/second to 12 meters/second during period of 3 seconds. The value of acceleration = ……………………………*

B)*A body of length 4 cm. at a distance of 6 cm. from convex lens, its focal length is 3 cm.*

-Mention the properties of the image formed. Showing the length of the image and the radius of the lens.

Question 3:

A) Write the scientific term:.

1. *It's located in one of the spiral arms of the Milky Way.*
2. *Fibers extended between the two poles of the cell in prophase.*
3. *Image which cannot be received on a screen.*

B) Compare between each of the following:.

1. *Reproduction by budding and reproduction by regeneration.*
   (From the point of an example for each of them).
2. *Type of the lens which is used in correcting short-sight and long-sight.*

Question 4:

A) Correct the underlined words:.

1. *The offspring resulted from the* ***vegetative reproduction*** *has traits different from the original organisms.*
2. *The image formed by using a concave lens is virtual and* ***equal to the object.***
3. *The* ***relative speed*** *is the speed when the object covers unequal distances at equal periods of time.*

B) *Give reasons for:.*

1. *Mass is a scalar physical quantity.*
   ………………………………………………………………………………
2. *The continuous expansion of the space.*
   ………………………………………………………………………………
3. *The sexual reproduction is the source of genetic variation.*
   ………………………………………………………………………………

Model Exam (2)

Question 1: A. complete each of the following:

1. The image that can be received on a screen is called………
2. The scientist who established the modern theory of the organ of the solar system is……….
3. When the male gamete fuses with the female gamete .... is formed.
4. Egyptian scientist Dr. Mustafa el said discovered a way to detect the cancer cell using the Nano molecules of…………

B. *A car its motion starts from rest and then its speed increases to 15 m/sec. through 5 seconds and another car its motion starts from rest and then its speed increases to 20 m/sec. through 10 seconds.*
Which of the two cars is moving at greater acceleration?

....
....

Question 2:

A. *Choose the correct answer:*

1. from the examples of the vector physical quantities is……….
a. the displacement. B. the mass c. the time d-the length
2. In the first meiotic division, a nuclear membrane is formed around the chromosomes at each of the cell's poles in……….
a- Anaphase. b- Telophase. C- Metaphase. D- Prophase.
4. The image formed by a convex lens when the body is placed at a distance greater than twice of its focal length is………..
a. real, inverted and equal to the object b. real, inverted and magnified.
c. real, inverted and diminished d. virtual ,upright and enlarged.



B-Mention one use for each of the following:

1. Contact lenses. ……………………………………………………
2. The light year. …………………………………………………….

C) 1. Show by drawing only the formation of an image is equal to the object using a concave mirror.

Question 3:

A. Write the scientific term:

1. A point inside the lens lies on the principle axis in the mid distance between its faces.
2. It's a wide and extended space that contains galaxies.
3. It's formed in the reproductive cell of the living organisms through meiosis.
4. The value of object's speed relative to the observer.

B. Complete the missing parts in the table and mention the law used in solutions:

Speed (m/sec).	Distance (m).	Time (sec.)
……………..	40m	8 sec.
2 m/sec.	…………	3 sec.
5 m/sec.	60 m	…………….

Question 4:

A. Correct the underlined words:

1. **Nine** planets rotate around the sun.

2. Each group of stars is gathered in the **solar system**.

3. In meiosis, each product cell contains the **twice** number of chromosomes of the parent cell.

C. ***Show by drawing only the direction of the light ray after passing through a convex lens in the following states:***

1. The incident light ray passing through the optical center of the lens.
2. The incident light ray parallel to the principle axis.
3. The incident light ray passing through the focus.



Model answer

Model Exam (1)

Question 1:.

A) Choose the correct answer:.

1-c 2-a 3-a 4-c

B) What happens when….?

1-reflect by focus.

2-seems at rest.

3-zygote formed.

Question 2:

Complete each of the following:

1-alfred hale 2-somatic cell 3- m/s^2

C) Real, inverted equal in size 4 cm length.

Question 3: C)Write the scientific term:.

1-solar system 2- spindle fiber 3- virtual

B) 1-Yeast fungus by budding
Star fish by regeneration.
2- short sightedness by concave lens ,long sightedness by convex.

Question 4:.

Correct the underlined words:.

a) 1-sexual reproduction 2- small 3-irregular speed

B) 1-needs magnitude only.
2- due to separation between galaxies.
3- **Bec**. It comes from two different sources by meiosis.



Model answer of Exam (2)

Question 1: A. complete each of the following:

1-Real 2- Alfred hale 3- Zygote 4- Gold

B) First car $a = 15/5 = 3 \ m/s^2$

Second car $a = 20/10 = 2 \ m/s^2$

Question 2:

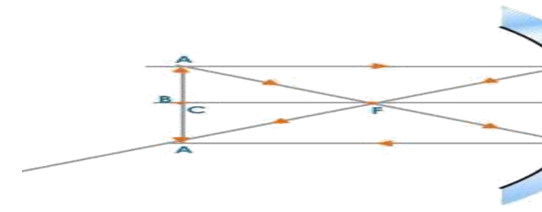
A. Choose the correct answer:

1-a 2-b 3-c

b) 1- to correct vision defect.

2- Measuring unit between celestial bodies.

c)



Question 3:

A-Write the scientific term:

1-optical center 2- universe 3- gametes 4- relative speed

b) A=5 B= 6 C=12

Question 4:

B .Correct the underlined words:

1-8 2- galaxies 3- half

C. Drawing:-

